Approaches in Bioremediation Ram Prasad 2018-12-08

Bioremediation refers to the clean-up of pollution in soil, groundwater, surface water, and air using typically microbiological processes. It uses naturally occurring bacteria and fungi or plants to degrade, transform or detoxify hazardous substances to human health or the environment. For bioremediation to be effective, microorganisms must enzymatically attack the pollutants and convert them to harmless products. As bioremediation can be effective only where environmental conditions permit microbial growth and action, its application often involves the management of ecological factors to allow microbial growth and degradation to continue at a faster rate. Like other technologies, bioremediation has its limitations. Some contaminants, such as chlorinated organic or high aromatic hydrocarbons, are resistant to microbial attack. They are degraded either gradually or not at all, hence, it is not easy to envisage the rates of clean-up for bioremediation implementation. Bioremediation represents a field of great expansion due to the important development of new technologies. Among them, several decades on metagenomics expansion has led to the detection of autochthonous microbiota that plays a key role during transformation. Transcriptomic guides us to know the expression of key genes and proteomics allow the characterization of proteins that conduct specific reactions. In this book we show specific technologies applied in bioremediation of main interest for research in the field, with special attention on fungi, which have been poorly studied microorganisms. Finally, new approaches in the field, such as CRISPR-CAS9, are also discussed. Lastly, it introduces management strategies, such as bioremediation application for managing affected environment and bioremediation approaches. Examples of successful bioremediation applications are illustrated in radionuclide entrapment and retardation, soil stabilization and remediation of polycyclic aromatic hydrocarbons, phenols, plastics or fluorinated compounds. Other emerging bioremediation methods include electro bioremediation, microbe-availed phytoremediation, genetic recombinant technologies in enhancing plants in accumulation of inorganic metals, and metalloids as well as degradation of organic pollutants, protein-metabolic engineering to increase bioremediation efficiency, including nanotechnology applications are also discussed.
Microbial Biodegradation and Bioremediation Surajit Das 2014-07-01 Microbial Biodegradation and Bioremediation brings together experts in relevant fields to describe the successful application of microbes and their derivatives for bioremediation of potentially toxic and relatively novel compounds. This single-source reference encompasses all categories of pollutants and their applications in a convenient, comprehensive package. Our natural biodiversity and environment is in danger due to the release of continuously emerging potential pollutants by anthropogenic activities. Though many attempts have been made to eradicate and remediate these noxious elements, every day thousands of xenobiotics of relatively new entities emerge, thus worsening the situation. Primitive microorganisms are highly adaptable to toxic environments, and can reduce the load of toxic elements by their successful transformation and remediation. Describes many novel approaches of microbial bioremediation including genetic engineering, metagenomics, microbial fuel cell technology, biosurfactants and biofilm-based bioremediation Introduces relatively new hazardous elements and their bioremediation practices including oil spills, military waste water, greenhouse gases, polythene wastes, and more Provides the most advanced techniques in the field of bioremediation, including insilico approach, microbes as pollution indicators, use of bioreactors, techniques of pollution monitoring, and more

Physiology of Biodegradative Microorganisms Colin Ratledge 2012-12-06 Environmental Pollutants and their Bioremediation Approaches Ram Naresh Bharagava 2017-07-06 This book is a compilation of detailed and latest knowledge on the various types of environmental pollutants released from various natural as well as anthropogenic sources, their toxicological effects in environments, humans, animals and plants as well as various bioremediation approaches for their safe disposal into the environments. In this book, an extensive focus has been made on the various types of environmental pollutants discharged from various sources, their toxicological effects in environments, humans, animals and plants as well as their biodegradation and bioremediation approaches for environmental cleanup.

Biology of Rhodococcus Héctor M. Alvarez 2010-09-07 Rhodococcus, a metabolically versatile actinobacteria which is frequently found in the environment, has gained increasing interest due to its potential biotechnological applications. This Microbiology Monographs volume provides a thorough review of the various aspects of the biochemistry, physiology and genetics of the Genus Rhodococcus. Following an overview of its taxonomy, chapters cover the structural aspects of rhodococcal cellular envelope, genomes and plasmids, metabolic and catabolic pathways, such as those of aromatic compounds, steroids and nitriles, and desulfurization pathways, as well as the adaption to organic solvents. Further reviews discuss applications of Rhodococcus in the bioremediation of contaminated environments, in triacylglycerol accumulation, and in phytopathic strategies, as well as the potential of biosurfactants. A final chapter describes the sole pathogenic Rhodococcus member, R. equi.

Recent Developments in Bioenergy Research Vijai G. Gupta 2020-06-21 Recent Developments in Bioenergy Research reviews all these topics, reports recent research findings, and presents potential solutions to challenging issues. The book consolidates the most recent research on the (bio)technologies, concepts and commercial developments that are currently in progress on different types of widely-used biofuels and integrated biorefineries across biochemistry, biotechnology, biochemical engineering and microbiology. Chapters include very recent/emerging topics, such as non-ionic and ionic liquids/surfactants for enhancement of lignocellulose enzymatic hydrolysis and lignocellulose biomass as a rich source of bio-ionic liquids. The book is a useful source of information for those
working in the area of industrial wastewater treatment and microbial fuel cells, but is also a great resource for senior undergraduate and graduate students, researchers, professionals, biochemical engineers and other interested individuals/groups working in the field of biofuel/bioenergy. Provides unique information on biomass-based biofuels for fundamental and applied research Outlines research advancements in the areas of bio-hydrogen, bioethanol, bio-methane and biorefineries Includes emerging topics on biomass (including wastes) characterization and its uses as a resource for environmental bioremediation and bioenergy Reviews enzyme engineering for biomass to bioproducts and biochemicals, lipids/bio-oil Focuses on biological/biochemical routes, as these options have the greatest potential to be the most cost-effective methods for biofuel/bioenergy production

**Bacterial Biosurfactants** Bolin Kumar Konwar 2022-03-10 This new volume offers comprehensive coverage of bacterial biosurfactants, the competitive new area of research that has exciting potential application in agriculture and petroleum exploration. The book helps readers to understand the synthesis of biosurfactants by some specific bacteria, their culture, and extraction toward use in bioremediation and enhanced crude oil recovery. The volume covers the gamut of topics in bacterial biosurfactants in nanostructure, including their comparison to synthetic surfactants, their interaction with microorganisms, and their biochemistry, characterization, genetics of production, bioremedial effects, and more. The volume also explores the myriad uses of bacterial biosurfactants, including in laundry detergents, cosmetics, food production, petroleum, agriculture, medicine and therapeutics, environment, metallurgy, etc. Attention to biosurfactants has been gradually increasing in recent years due to the possibility of their production through fermentation technology and their potential applications in environmental protection. Despite their numerous advantages over synthetic chemical surfactants, biosurfactants have been unable to compete with chemically synthesized surfactants due to high production costs in relation to the inefficient bioprocessing techniques, poor strain productivity, and use of costly substrates. This volume helps to identify the factors that need to be addressed to reduce the cost of production of biosurfactants.

**Smart Bioremediation Technologies** Pankaj Bhatt 2019-06-07 Smart Bioremediation Technologies: Microbial Enzymes provides insights into the complex behavior of enzymes and identifies metabolites and their degradation pathways. It will help readers work towards solutions for sustainable medicine and environmental pollution. The book highlights the microbial enzymes that have replaced many plant and animal enzymes, also presenting their applications in varying industries, including pharmaceuticals, genetic engineering, biofuels, diagnostics and therapy. In addition, new methods, including genomics and metagenomics, are being employed for the discovery of new enzymes from microbes. This book brings all of these topics together, representing the first resource on how to solve problems in bioremediation. Provides the most novel approaches in enzyme studies Gives insights in real-time enzymology that are correlated with bioremediation Serves as a valuable resource on the use of genomes, transcriptomes and proteomes with bioremediation Refers to enzymes as diagnostic tools

**Toxicity and Waste Management Using Bioremediation** Rathoure, Ashok K. 2015-12-02 Bioremediation is an emerging field of environmental research. The objective of a bioremediation process is to immobilize contaminants (reactants) or to transform them into chemical products that do not pose a risk to human health and the environment. Toxicity and Waste Management Using Bioremediation provides relevant theoretical and practical frameworks and the latest empirical research findings on the remediation of contaminated soil and groundwater using bioorganisms. Focusing on effective waste treatment
methodologies and management strategies that lead to improved human and environmental health, this timely publication is ideal for use by environmental scientists, biologists, policy makers, graduate students, and scholars in the fields of environmental science, chemistry, and biology.

**Abatement of Environmental Pollutants** Pardeep Singh
2019-08-27 Abatement of Environmental Pollutants: Trends and Strategies addresses new technologies and provides strategies for environmental scientists, microbiologists and biotechnologists to help solve problems associated with the treatment of industrial wastewater. The book helps readers solve pollution challenges using microorganisms in bioremediation technologies, including discussions on global technologies that have been adopted for the treatment of industrial wastewater and sections on the lack of proper management. Moreover, limited space, more stringent waste disposal regulations and public consciousness have made the present techniques expensive and impractical. Therefore, there is an urgent need to develop sustainable management technologies for industries and municipalities. To remove the damaging effect of organic pollutants on the environment, various new technologies for their degradation have been recently discovered. Covers bioremediation of petrochemical pollutants, such as Benzene, Toluene, Xylene, Ethyl Benzene, and phenolic compound Includes discussions on genetic engineering microbes and their potential in pollution abatement Contains information on plant growth promoting bacteria and their role in environment management.

**Mycoremediation and Environmental Sustainability** Ram Prasad
2021-04-30 Volume 3 covers recent research with expanded coverage on this important area of remediation. Mycoremediation is the form of bioremediation in which fungi-based technology is used to decontaminate the environment. Fungi are among the primary saprotrophic organisms in an ecosystem, as they are efficient in the decomposition of organic matter. Wood-decay fungi, especially white rot, secretes extracellular enzymes and acids that break down lignin and cellulose. Fungi have been proven to be a very cost-effective and environmentally-friendly way for helping to remove a wide array of toxins from damaged environments or wastewater. These toxins include heavy metals, persistent organic pollutants, textile dyes, leather tanning industry chemicals and wastewater, petroleum fuels, polycyclic aromatic hydrocarbon, pharmaceuticals and personal care products, pesticides and herbicides, in land, fresh water and marine environments. Bioremediation of toxic organics by fungi is the most sustainable and green route for cleanup of contaminated sites and we discuss the multiple modes employed by fungi for detoxification of different toxic and recalcitrant compounds including prominent fungal enzymes viz., catalases, general lipase, laccases, peroxidases and sometimes intracellular enzymes, especially the cytochrome P450 monoxygeneses. Fungi play an important role in the biogeochemical cycling of manganese and other redox-active metals, which is related to their ability to survive radiation and other oxidative challenges. This book covers recent research with more detail on the various types of fungi and associated fungal processes used to clean up wastes and wastewaters in contaminated environments, and discusses their potential for environmental applications.

**Removal of Refractory Pollutants from Wastewater Treatment Plants** Maulin P. Shah 2021-10-08 This book discusses new and innovative trends and techniques in the removal of toxic and or refractory pollutants through various environmental biotechnological processes from wastewater, both at the laboratory and industrial scale. It focuses primarily on environmentally-friendly technologies which respect the principles of sustainable development, including the advanced trends in remediation through an approach of environmental biotechnological processes from either industrial or sewage wastewater. Features: Examines the fate and occurrence of...
refractory pollutants in wastewater treatment plants (WWTPs) and the potential approaches for their removal. Highlights advanced remediation procedures involving various microbiological and biochemical processes. Assesses and compares the potential application of numerous existing treatment techniques and introduces new, emerging technologies. Removal of Refractory Pollutants from Wastewater Treatment Plants is suitable for practicing engineers, researchers, water utility managers, and students who seek an excellent introduction and basic knowledge in the principles of environmental bioremediation technologies.

Biological Approaches to Controlling Pollutants
Sunil Kumar
2021-09-23 Biological Approaches to Controlling Pollutants, the latest release in the Advances in Pollution Research series, is a comprehensive guide on the most up-to-date biological methods for remediation of pollutants across a variety of industries, with consideration for the advantages, disadvantages and applications of each method. Considering the increasing levels of pollution and contaminated sites worldwide from high population growths and industrial expansion, the most recent advances in biological remediation techniques is an important field of study and one in which researchers need the most cutting-edge methodologies. This book is a necessary read for environmental scientists, along with postgraduates, academics and researchers working in the area of environmental pollution. It will also be of interest to environmental engineers and any other practitioners who need to evaluate the latest advances in biotechnological control of pollutants. Presents the most cutting-edge advances in a variety of fields relevant to the use of biotechnology and biological techniques in pollutant control Provides in-depth information and methodologies for applying bioremediation to a variety of pollutants Written by a worldwide team of authors to provide a global perspective on the advances in bioremediation

Fungi as Bioremediators
Ebrahim Mohammadi Goltapeh
2013-02-06 Biological remediation methods have been successfully used to treat polluted soils. While bacteria have produced good results in bioremediation for quite some time now, the use of fungi to decontaminate soils has only recently been established. This volume of Soil Biology discusses the potentials of filamentous fungi in bioremediation. Fungi suitable for degradation, as well as genetically modified organisms, their biochemistry, enzymology, and practical applications are described. Chapters include topics such as pesticide removal, fungal wood decay processes, remediation of soils contaminated with heavy and radioactive metals, of paper and cardboard industrial wastes, and of petroleum pollutants.

In Situ Bioremediation
National Research Council
1993-02-01 In situ bioremediation--the use of microorganisms for on-site removal of contaminants--is potentially cheaper, faster, and safer than conventional cleanup methods. But in situ bioremediation is also clouded in uncertainty, controversy, and mistrust. This volume from the National Research Council provides direction for decisionmakers and offers detailed and readable explanations of the processes involved in in situ bioremediation, circumstances in which it is best used, and methods of measurement, field testing, and modeling to evaluate the results of bioremediation projects. Bioremediation experts representing academic research, field practice, regulation, and industry provide accessible information and case examples; they explore how in situ bioremediation works, how it has developed since its first commercial use in 1972, and what research and education efforts are recommended for the future. The volume includes a series of perspective papers. The book will be immediately useful to policymakers, regulators, bioremediation practitioners and purchasers, environmental groups, concerned citizens, faculty, and students.

Bioremediation for Environmental Sustainability
Gaurav Saxena
2020-10-13 Bioremediation for Environmental Sustainability: Toxicity, Mechanisms of Contaminants Degradation,
Detoxification and Challenges introduces pollution and toxicity profiles of various organic and inorganic contaminants, including mechanisms of toxicity, degradation, and detoxification by microbes and plants, and their bioremediation approaches for environmental sustainability. The book also covers many advanced technologies in the field of bioremediation and phytoremediation, including electro-bioremediation, microbial fuel cells, nano-bioremediation, constructed wetlands, phytotechnologies, and many more, which are lacking in other competitive titles existing in the market. The book includes updated information, as well as future directions for research, in the field of bioremediation of industrial wastes. This book is a reference for students, researchers, scientists, and professionals in the fields of microbiology, biotechnology, environmental sciences, eco-toxicology, environmental remediation, and waste management, especially those who aspire to work on the biodegradation and bioremediation of industrial wastes and environmental pollutants for environmental sustainability.

Environmental safety and sustainability with rapid industrialization is one of the major challenges worldwide. Industries are the key drivers in the world economy, but these are also the major polluters due to discharge of potentially toxic and hazardous wastes containing various organic and inorganic pollutants, which cause environmental pollution and severe toxic effects in living beings. Introduces pollution and toxicity profiles of environmental contaminants and industrial wastes, including oil refinery wastewater, distillery wastewater, tannery wastewater, textile wastewater, mine tailing wastes, plastic wastes, and more Describes underlying mechanisms of degradation and detoxification of emerging organic and inorganic contaminants with enzymatic roles Focuses on recent advances and challenges in bioremediation and phytoremediation, including microbial enzymes, biosurfactants, microalgae, biofilm, archaea, genetically engineered organisms, and more Describes how microbes and plants can be successfully applied for the remediation of potentially toxic industrial wastes and chemical pollutants to protect the environment and public health.

Handbook of Metal-Microbe Interactions and Bioremediation
Surajit Das 2017-04-07 Around the World, metal pollution is a major problem. Conventional practices of toxic metal removal can be ineffective and/or expensive, delaying and exacerbating the crisis. Those communities dealing with contamination must be aware of the fundamentals advances of microbe-mediated metal removal practices because these methods can be easily used and require less remedial intervention. This book describes innovations and efficient applications for metal bioremediation for environments polluted by metal contaminants.

Biodegradation and Bioremediation of Polluted Systems
Rolando Chamy 2015-12-17 This book contains a collection of research works focused on the biodegradation of different types of pollutants, both in water and solids. The book is divided in three major sections: A) Biodegradation of organic pollutants in solids and wastewater, B) Biodegradation of complex pollutants, and C) Novel technologies in biodegradation and bioremediation.

Coastal Fluxes in the Anthropocene
Christopher J. Crossland 2006-03-30 This book synthesizes knowledge of coastal and riverine material fluxes, biogeochemical processes and indications of change, both natural, and increasingly human-initiated. Here, the authors assess coastal flux in the past and present, and in future under the International Geosphere-Biosphere Programme (IGBP), the International Human Dimensions Programme on Global Environmental Change (IHDP) and the LOICZ II (Land-Ocean Interactions in the Coastal Zone) Project.

Advances in Bioremediation of Wastewater and Polluted Soil
Naofumi Shiomi 2015-09-09 The pollution of soil and groundwater by heavy metals and other chemicals is becoming a serious issue in many countries. However, the current bioremediation...
processes do not often achieve sufficient remediation, and more effective processes are desired. This book deals with advances in the bioremediation of polluted soil and groundwater. In the former chapters of this book, respected researchers in this field describe how the optimization of microorganisms, enzymes, absorbents, additives and injection procedures can help to realize excellent bioremediation. In the latter chapters, other researchers introduce bioremediation processes that have been performed in the field and novel bioremediation processes. Thus, the readers will be able to obtain new ideas about effective bioremediation as well as important information about recent advances in bioremediation.

**Emerging Eco-friendly Green Technologies for Wastewater Treatment** Ram Naresh Bharagava 2020-03-04 As we know, rapid industrialization is a serious concern in the context of a healthy environment and public health due to the generation of huge volumes of toxic wastewater. Although various physico-chemical and biological approaches are available for the treatment of this wastewater, many of them are not effective. Now, there a number of emerging ecofriendly, cost-effective approaches utilizing microorganisms (bacterial/fungi/algae), green plants or their enzymes, and constructed wetland treatment systems in the treatment of wastewaters containing pollutants such as endocrine disrupting chemicals, toxic metals, pesticides, dyes, petroleum hydrocarbons and phenolic compounds. This book provides a much-needed, comprehensive overview of the various types of wastewater and their ecotoxicological effects on the environment, humans, animals and plants as well as various emerging and eco-friendly approaches for their treatment. It provides insights into the ecological problems and challenges in the treatment and management of wastewaters generated by various sources.

**Heavy Metals in Soils** B. J. Alloway 1995 Heavy metals in soils continue to receive increasing attention due to the growing scientific and public awareness of environmental issues and the development of analytical techniques to measure their concentrations accurately. Building on the success and acclaim of the first edition, this book continues to provide an up-to-date, balanced and comprehensive review of the subject in two sections: the first providing an introduction to the metals chemistry, sources and methods used for their analysis; and the second containing chapters dealing with individual elements in detail.

**Polar Microbiology** Asim K. Bej 2009-12-23 Pollution has accompanied polar exploration since Captain John Davis’ arrival on the Antarctic continent in 1821 and has become an unavoidable consequence of oil spills in our polar regions. Fortunately, many of the organisms indigenous to Polar ecosystems have the ability to degrade pollutants. It is this metabolic capacity that forms the basis for bioremediation as a potential treatment for the hydrocarbons that contaminate the pristine polar environments. The only book to cover the breadth of microbial ecology and diversity in polar regions with an emphasis on bioremediation, Polar Microbiology: The Ecology, Biodiversity, and Bioremediation Potential of Microorganisms in Extremely Cold Environments examines the diversity of polar microorganisms and their ability to degrade petroleum hydrocarbon contaminants in polar terrestrial and aquatic environments. Providing a unique perspective of these microorganisms in extremely cold temperatures, the book focuses on their taxonomy, physiology, biochemistry, population structure, bioremediation potential, and potential for biotechnology applications. Leading investigators in the field provide complete coverage of the microbiology relevant to the study of biodiversity and biodegradation of pollutants in the Arctic and Antarctic, including: Microbial extremophiles living in cold and subzero temperature environments Genetics and physiology of cold adaptation of microorganisms Biodegradative
microbial consortia in a defined closed environment Molecular characterization of biodegradative microbial populations Molecular approaches to assess biodegradation of petroleum hydrocarbons Environmental impact of hydrocarbon contamination Microbial biodiversity across Antarctic deserts By bringing together the current state of scientific knowledge and research on microbial community structures in extremely cold temperatures, this thought provoking resource is the ideal starting point for the research that must be done if we are to effectively reduce human’s eco-footprint on our polar regions. **Fungi in Bioremediation** G. M. Gadd 2001-11-15 An authoritative account of the application of fungi to the treatment of environmental pollution. **Remediation of Heavy Metals** Inamuddin **Pesticides Bioremediation** Sazada Siddiqui 2022-06-08 This volume offers the latest theory, procedures, techniques and applications pertaining to the bioremediation of pesticides, as well as current case studies. The book is composed of chapters written by global experts and is divided into three topical sections. Section A deals with concepts and mechanisms of pesticides bioremediation; Section B examines latest tools and techniques; Section C offers global case studies of pesticides bioremediation. The novel methods described here are timely, as traditional pesticide usage leads to high wastage via decay, vaporization and seepage. This of course leads to environmental contamination and has necessitated the development and use of novel technologies like bioremediation for minimizing the impact of pesticides on the environment. This volume will be of relevance to academics, researchers and students who are working in the realm of pesticide bioremediation, and will enable policy makers and managerial experts across the globe in drafting policies and strategies for the management and treatment of pesticides.

**Bioremediation in Latin America** Analía Alvarez 2014-10-06 The book compiles an update information about the state of bioremediation in emerging Latin American countries. Some of the studied regions are sites that suffered decades of pollution by agrochemicals, heavy metals and industrial waste due to the lack of control by government regulations. Such is the case of Northern Argentina, where were illegally deposited over 30 tn of obsolete organochlorine pesticides in 1994. The content has focused in the use of native organisms (from bacteria to plants) as a viable solution to the problem of pollution, using low-cost and powerful techniques, socially well accepted and appropriate from the environmental point of view. In this context, levels of pesticide found in the Latin American population are informed. It was also displayed as a multidisciplinary approach based on concerns of a diverse group of researchers (biochemists, biologists, chemical engineers and geneticists) about a global problem, dealing with specific cases of study, with a view to project their findings to worldwide. In this regard, researchers provide their findings to regulatory sectors, whom could make appropriate decisions.

**Geo-Biologically Important Oil Indicating Microorganisms of Sub-Saharan Region. Screening of Oil Indicating Microorganisms from Major Geo-Political Zones of Yobe State-Nigeria** Debajyoti Bose 2016-12-30 Project Report from the year 2014 in the subject Biology - Micro- and Molecular Biology, grade: PDF, course: Personal Research Project, language: English, abstract: Ancient rocks and natural oils are rich with abundant and hidden information of ancient organic matters responsible for earth formation, including molecular and isotopic signatures of the organisms that existed at the time the organic matter was formed. Considering the above facts of astrobiology, research study was carried out on screening of oil indicating microorganisms from oil contaminated sites of major geo-political zones of Yobe State, Nigeria including Damaturu, Gashua, Potiskum and Nguru local Government areas. Serial dilution was performed for all soil samples collected from the oil contaminated...
sites of mentioned local government areas followed by culture isolation and identification techniques for bacterial samples only. Nutrient agar was used for the isolation of the bacteria from the soil samples and mixed cultures were obtained. These bacterial cultures were inoculated in petroleum in order to see their oil utilizing capability. Two types of culture showed positive results among all isolated colonies. Rhizoid shaped gram positive rods isolated from soils of Damaturu, Gashua, Potiskum and Nguru & yellow pigmented gram negative bacterial colony isolated from soils of Potiskum and Nguru showed oil utilizing ability by positive growth in the refined crude oil (Petroleum, Diesel, etc.). The oil utilizing ability of those specific bacteria shows their potentiality in detecting the presence of oil and acting as potential oil indicators in Sub-Saharan region of African Continent caring a long history of bio-geo sciences. Findings from the present research work may create an opening for encouraging the geo-biological potentials of West African Countries in astrobiological aspects.

**Handbook of Research on Inventive Bioremediation Techniques**

Bhakta, Jatindra Nath 2017-01-26 The rapid progression of technology has significantly impacted population growth, urbanization, and industrialization in modern society. These developments, while positive on the surface, have created critical environmental problems in recent years. The Handbook of Research on Inventive Bioremediation Techniques is a comprehensive reference source for the latest scholarly information on optimizing bioremediation technologies and methods to control pollution and enhance sustainability and conservation initiatives for the environment. Highlighting pivotal research perspectives on topics such as biodegradation, microbial tools, and green technology, this publication is ideally designed for academics, professionals, graduate students, and practitioners interested in emerging techniques for environmental decontamination.

**Advances in Applied Bioremediation**

Ajay Singh 2009-07-30 Bioremediation is a rapidly advancing field and the technology has been applied successfully to remediate many contaminated sites. The goal of every soil remediation method is to enhance the degradation, transformation, or detoxification of pollutants and to protect, maintain and sustain environmental quality. Advances in our understanding of the ecology of microbial communities capable of breaking down various pollutants and the molecular and biochemical mechanisms by which biodegradation occurs have helped us in developing practical soil bioremediation strategies. Chapters dealing with the application of biological methods to soil remediation are contributed from experts - authorities in the area of environmental science including microbiology and molecular biology – from academic institutions and industry.

**Bioremediation of Contaminated Soils**

Donald L. Wise 2000-06-09 This volume focuses on innovative bioremediation techniques and applications for the cleanup of contaminated media and sites. It includes quantitative and design methods that elucidate the relationships among various operational parameters, and waste chemistry that defines the cost effectiveness of bioremediation projects. It also presents numerical models.

**Phyto and Rhizo Remediation**

Naveen Kumar Arora 2019-11-15 The increasing human population and the associated activities have negatively influenced the ecosystems and life on earth. The continuous addition of agrochemicals, heavy metals and industrial wastes/effluents in the ecosystems have caused great harm, including loss of productivity, biodiversity, climate change and diseases in plants, animals and humans, resulting in increased marginal lands and endangered sustainability of life on earth. Hence, there is an urgent need to reverse the impact of dangerous pollutants through a holistic, sustainable and biotic approach. Bioremediation involves the utilization of biological systems, mainly plants (phytoremediation) or microorganisms or
both in combination (rhizoremediation) for the removal or degradation of pollutants and revive the habitats in an eco-friendly manner. Recently, there have been many success stories related to bioremediation involving plants or plant-microbe interactions. These success stories are related to the removal of heavy metals, pesticides, polyaromatic hydrocarbons, explosives, radionuclides or reduction of biological oxygen demand, total dissolved solids, total suspended solids, oil spills in water bodies. Rhizoremediation has also been successfully used for reclamation of saline or marginal soils. With the range of pollutants and the total area (on earth) covered by these toxic chemicals, it is important that these eco-friendly technologies be utilized in a better way. The book throws light on the recent happenings, research and success stories related to bioremediation of polluted habitats through phytoremediation or rhizoremediation. The book also highlights some of the significantly important plant and microbial species involved in remediation, the physiology, biochemistry and the mechanisms of remediation by various plants and microbes, and suggestions for future improvement of bioremediation technology.

**Microorganisms in Environmental Management** T. Satyanarayana 2012-01-02 Microbes and their biosynthetic capabilities have been invaluable in finding solutions for several intractable problems mankind has encountered in maintaining the quality of the environment. They have, for example, been used to positive effect in human and animal health, genetic engineering, environmental protection, and municipal and industrial waste treatment. Microorganisms have enabled feasible and cost-effective responses which would have been impossible via straightforward chemical or physical engineering methods. Microbial technologies have of late been applied to a range of environmental problems, with considerable success. This survey of recent scientific progress in usefully applying microbes to both environmental management and biotechnology is informed by

acknowledgement of the polluting effects on the world around us of soil erosion, the unwanted migration of sediments, chemical fertilizers and pesticides, and the improper treatment of human and animal wastes. These harmful phenomena have resulted in serious environmental and social problems around the world, problems which require us to look for solutions elsewhere than in established physical and chemical technologies. Often the answer lies in hybrid applications in which microbial methods are combined with physical and chemical ones. When we remember that these highly effective microorganisms, cultured for a variety of applications, are but a tiny fraction of those to be found in the world around us, we realize the vastness of the untapped and beneficial potential of microorganisms. At present, comprehending the diversity of hitherto uncultured microbes involves the application of metagenomics, with several novel microbial species having been discovered using culture-independent approaches. Edited by recognized leaders in the field, this penetrating assessment of our progress to date in deploying microorganisms to the advantage of environmental management and biotechnology will be widely welcomed.

**Associative and Endophytic Nitrogen-fixing Bacteria and Cyanobacterial Associations** Claudine Elmerich 2007-05-19 This self-contained volume covers fundamental and applied aspects of nitrogen-fixation research. The book describes milestones in the discovery of the associative and endophytic nitrogen-fixing bacteria found involved with cereal crops, forage grasses, and sugar cane. It provides a comprehensive overview of their phylogeny, physiology, and genetics as well as of the biology of their association with their host plants, including tools for in situ localization and population-dynamics analysis. Also included are chapters describing the functions required for a bacterium to be competent and competitive in the rhizosphere, and analysis of associations of cyanobacteria with fungi, diatoms, bryophytes, cycads, Azolla, and Gunnera.
Microbial Biostimulants for Sustainable Agriculture and Environmental Bioremediation Inamuddin 2022-06-29 Today, the agriculture industry is confronted with simultaneous issues of how to fully embrace mass production of safer food in terms of both quality and quantity. Most industries are concerned with avoiding significant levels of soil pollution and environmental threats as a result of the excessive and harmful use of synthetic products on crops. Therefore, there is a need to adopt sustainable technological innovations that can ensure the sustainability of agricultural production systems. Microbial Biostimulants for Sustainable Agriculture and Environmental Bioremediation discusses the benefits, challenges, and practical applications of eco-friendly biotechnological techniques using biostimulants derived from beneficial microorganisms. The chapters cover the use of these organisms to increase crop production, enhance soil fertility and maintain soil health, create crop and plant tolerance to different abiotic stressors, release required nutrients to the soil, increase resistance to plant pathogens/pests, improve nutrient use efficiency of crops, and rejuvenate polluted environments. FEATURES Explores the physiological, morpho-anatomical, and biochemical molecular plant rejoinders involved in stimulating crop productivity Provides information on the physiological, cellular, and molecular modes of action underlying microbial biostimulant interfaces Summarizes methods and approaches for executing microbial stimulant technology Outlines numerous environmental management and remediation strategies This book is an ideal resource for researchers, engineers, and academics working in soil science, crop science, water remediation, microbiology, and biotechnology.

Biosorption of Heavy Metals Bohumil Volesky 1990-08-15 This state-of-the-art volume represents the first comprehensively written book which focuses on the new field of biosorption. This fascinating work conveys essential fundamental information and outlines the perspectives of biosorption. It summarizes the metal-sorbing properties of nonliving bacterial, fungal, and algal biomass, plus highlights relevant metal-binding mechanisms. This volume also discusses the aspects of obtaining and processing microbial biomass and metal-chelating chemicals into industrially applicable biosorbent products. Microbiologists, chemists, and engineers with an interest in new technological and scientific horizons will find this reference indispensable.

Soil Microenvironment for Bioremediation and Polymer Production Nazia Jamil 2020-01-09 The book consists of 21 chapters by subject matter experts and is divided into four parts: Soil Microenvironment and Biotransformation Mechanisms; Synergistic effects between substrates and Microbes; Polyhydroxyalakanoates: Resources, Demands and Sustainability; and Cellulose based biomaterials: Benefits and challenges. Included in the chapters are classical bioremediation approaches and advances in the use of nanoparticles for removal of radioactive waste. The book also discusses the production of applied emerging biopolymers using diverse microorganisms. All chapters are supplemented with comprehensive illustrative diagrams and comparative tables.

Soil Bioremediation Javid A. Parray 2021-03-22 This book will discuss the effective and sustainable technological approaches for remediation of contaminates via eco-friendly usage of microbes. The primary focus will be on the role of microbes, particularly bacteria and fungi, for the degradation and removal of various xenobiotic substances in the environment. The book will also emphasize molecular approaches and biosynthetic pathways of microbes, and present gene and protein expression studies for bio-deterioration techniques. New innovative and sophisticated green technologies for waste minimization and waste control will be presented, as well as the potential of microbes for various techniques of bioremediation, including bio-sorption, bio-augmentation, bio-stimulation, to clean contaminated environments.
Biodegradation and Bioremediation  Ajay Singh 2013-03-09 In this volume, experts from universities, government labs and industry share their findings on the microbiological, biochemical and molecular aspects of biodegradation and bioremediation. The text covers numerous topics, including: bioavailability, biodegradation of various pollutants, microbial community dynamics, properties and engineering of important biocatalysts, and methods for monitoring bioremediation processes. Microbial processes are environmentally compatible and can be integrated with non-biological processes to detoxify, degrade and immobilize environmental contaminants.

Microbial Rejuvenation of Polluted Environment  Deepak G. Panpatte 2021-01-15 Pollution is one of the most serious issues facing mankind and other life forms on earth. Environmental pollution leads to the degradation of ecosystems, loss of services, economic losses, and various other problems. The eco-friendliest approach to rejuvenating polluted ecosystems is with the help of microorganism-based bioremediation. Microorganisms are characterized by great biodiversity, genetic and metabolic machinery, and by their ability to survive, even in extremely polluted environments. As such, they are and will remain the most important tools for restoring polluted ecosystems / habitats. This three-volume book sheds light on the utilization of microorganisms and the latest technologies for cleaning up polluted sites. It also discusses the remediation or degradation of various important pollutants such as pesticides, wastewater, plastics, PAHs, oil spills etc. The book also explains the latest technologies used for the degradation of pollutants in several niche ecosystems. Given its scope, the book will be of interest to teachers, researchers, bioremediation scientists, capacity builders and policymakers. It also offers valuable additional reading material for undergraduate and graduate students of microbiology, ecology, soil science, and the environmental sciences.